



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>6</sup> : <b>A61B 17/12</b></p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 99/65400</b></p> <p>(43) International Publication Date: 23 December 1999 (23.12.99)</p>
<p>(21) International Application Number: PCT/IE99/00052</p> <p>(22) International Filing Date: 15 June 1999 (15.06.99)</p> <p>(30) Priority Data: S980471 16 June 1998 (16.06.98) IE</p> <p>(71)(72) Applicants and Inventors: GHAREEB, Essam [EG/IE]; Lauravale, Corofin, County Clare (IE). DELASSUS, Patrick [FR/IE]; Tyrone, Kilcolgan, County Galway (IE).</p> <p>(74) Agent: CASEY, Lindsay, Joseph; F. R. Kelly &amp; Co., 27 Clyde Road, Ballsbridge, Dublin 4 (IE).</p>		<p>(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report.</p>
<p>(54) Title: A DEVICE FOR ENABLING THE TREATMENT OF HAEMORRHOIDS</p> <div data-bbox="406 1134 1088 1680"> </div> <p>(57) Abstract</p> <p>A device for enabling the treatment of haemorrhoids includes a barrel (11) having a longitudinal bore with an opening (32) at the free end of the barrel. A pump action handle (12) communicates with the opening (32) via the bore to establish a reduced air pressure in the opening (32) for drawing a haemorrhoid into the opening. A plurality of rubber bands (33 to 37) are stretched circumferentially around the barrel near its free end on a tubular fabric (42). A trigger mechanism (13) is arranged to draw the free forward end of the fabric progressively around the end of the barrel and into the opening (32) to release the rubber bands consecutively off the free end of the barrel onto the haemorrhoid.</p>		

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## A DEVICE FOR ENABLING THE TREATMENT OF HAEMORRHOIDS

The invention relates to a device for enabling the treatment of haemorrhoids or piles.

5        Haemorrhoids are dilated veins in the anal canal. Their occurrence in the population is extremely common and can usually be treated in an outpatient clinic depending on the severity of the condition. In medical terms, there are four degrees of severity known as  
10 first, second, third and fourth degree.

Various methods of treatment are used including infrared coagulation, radiofrequency coagulation, direct current coagulation, rubber band ligation, sclerotherapy, cryosurgery, scalpel surgery and laser  
15 surgery.

The least expensive and most widely used technique is rubber band ligation which is suitable for the first to the third degree haemorrhoids. The method has been in use for a considerable period of time and  
20 has been proved to be very effective.

In the known technique, a relatively long forceps is employed to hold the haemorrhoid which is threaded through an O-ring located at the end of a relatively long arm. The external part of the O-ring holds a  
25 rubber band. Once the forceps has grasped the haemorrhoid, the rubber band is fired from the O-ring by a well known mechanism. The problems with the known technique include the requirement for two people to perform it; one to hold the anoscope and the other to

apply the bands. An anoscope is required in order to visually observe the location of the haemorrhoid. Because it is necessary to have two people perform the technique, misfiring of the bands is frequent and  
5 readjustment is therefore required. In the event of bleeding, sterilisation of the instrument between patients is necessary which can take about fifteen - twenty minutes. As each patient usually requires two to three bands to be applied, the O-ring must be loaded  
10 each time with a fresh band. Thus, the O-ring must be removed while maintaining the anoscope in place between rubber band applications. Sometimes, the anoscope has to be removed and reinserted.

It is an object of the present invention to  
15 provide an improved device for enabling the treatment of haemorrhoids.

According to the present invention there is provided a device for enabling the treatment of haemorrhoids, the device including a barrel having an  
20 opening at a free end thereof, means for releasably retaining at least one rubber band stretched circumferentially around the barrel adjacent the free end, means for drawing a haemorrhoid into the opening, and means for releasing the rubber band off the free  
25 end of the barrel onto the haemorrhoid.

The invention will be understood in greater detail from the following description of a preferred embodiment thereof given by way of example only and with reference to the accompanying drawings in which:

FIGURE 1 is a perspective view of a device according to the invention;

FIGURE 2 is a side elevation of the device of Figure 1 of the drawings;

5       FIGURE 3 is a plan view of the device of Figure 2 of the drawings;

FIGURE 4 is a front elevation of the device of Figure 2 of the drawings;

10       FIGURE 5 is a cutaway view of the device of Figure 2 of the drawings;

FIGURE 6 shows the two part construction of the device of Figure 1 of the drawings;

15       FIGURE 7 is a perspective view of a vacuum mechanism for use with the device of Figure 1 of the drawings;

FIGURE 8 is a side elevation of the device of Figure 1 of the drawing in a first condition of use;

FIGURE 9 is a side elevation of the device of Figure 1 of the drawings in a last condition of use;

20       FIGURE 10 is an enlarged side elevation of part of the device of Figure 1 of the drawings;

FIGURE 11 is a cross-sectional view of the device of Figure 10 of the drawings taken along the line A-A and viewed in the direction of the associated arrows;

25       FIGURE 12 is a cross-sectional view of the device of Figure 10 of the drawings taken along the line B-B and viewed in the direction of the associated arrows;

FIGURE 13 is a cross-sectional view of the device of Figure 10 of the drawings taken along the line C-C and viewed in the direction of the associated arrows;

FIGURE 14 is a cross-sectional view of the device of Figure 10 of the drawings taken along the line D-D and viewed in the direction of the associated arrows and in a first condition of use;

FIGURE 15 is a cross-sectional view of the device of Figure 10 of the drawings taken along the line D-D and viewed in the direction of the associated arrows and in a second condition of use;

FIGURE 16 is a longitudinal cross-sectional view of the cartridge alone of the device of Figure 13 of the drawings;

FIGURE 17 is an exploded view of a trigger device for use with the device of Figure 1 of the drawings ;

FIGURES 18-20 are perspective views of the trigger device of Figure 17 in various stages of assembly;

FIGURE 21 is perspective view of part of the device of Figure 1 being assembled;

FIGURE 22 is a bottom plan view of part of the device of Figure 1 of the drawings;

FIGURE 23 is an enlarged view of part of the device of Figure 22 of the drawings;

FIGURE 24 is a cross-sectional view of part of the device of Figure 1 of the drawings in a first condition of use;

FIGURE 25 is a cross-sectional view of part of the device of Figure 1 of the drawings in a second condition of use;

FIGURE 26 is a cross-sectional view of part of the device of Figure 1 of the drawings in a first condition of use;

FIGURE 27 is a cross-sectional view of part of the device of Figure 1 of the drawings in a second condition of use;

FIGURE 28 is an enlarged view of part of the device of Figure 24 of the drawings;

FIGURE 29 is an enlarged view of part of the device of Figure 25 of the drawings; and

FIGURES 30-33 are simplified schematic cross-sectional views of the device in use in the various stages of the treatment of a haemorrhoid.

Referring now to the drawings, there is shown a device 10 according to the invention. Generally, the device 10 is in the shape of a gun having a barrel 11, a handle 12 and a trigger mechanism 13.

The barrel 11 comprises a forwardly disposed end 112 and a rearwardly disposed end 113. The end 112 comprises a first tubular element 114 and a second tubular element 115. The diameter of the element 115 is greater than that of the first element 114. The elements 114 and 115 are integral with each other. Between the element 115 and the end 113, the barrel 11 is comprised of a first intermediate part 116 and a second intermediate part 117. Both of the parts 116,

117 are of substantially square cross-section.

However, the cross-sectional area of the part 117 is less than that of the part 116. The parts 116, 117 are integral with each other.

5           The second element 115 is integral with the part 116 at the rear end of a circular opening 118 in the element 116. The purpose of the opening 118 will become clearer later in the specification. The element 115 has a pair of diametrically disposed through bores  
10 119, 120 which are in communication with, and in axial alignment with, similar bores 121, 122 in the parts 116. The bores 121, 122 terminate in respective openings 123, 124 in the element 116. The openings 123, 124 are on the face 127 of the part 116 which is  
15 not in contact with the part 117. Opposing the face 127 is a face 128 of the handle 12. A central bore 130 extends longitudinally through the barrel 11 from the free end of the barrel, i.e. the front end of the tubular element 114, through the elements 116, 117 and  
20 the upper part of the handle 12 to the rear of the handle. The bore 130 opens to the atmosphere both at the forward end of the element 114 and at an opening 110 in the handle 12. A bore 111 is also provided in the handle 12 which is in communication with the bore  
25 130 thereby providing a bifurcated bore 130, 111.

With particular reference to Figures 22, 23 the underneath surface 90 of the second intermediate part 117 incorporates a first track 91 and a second track 92. The tracks 91, 92 run longitudinally and



notionally connect the first intermediate part 116 and the second intermediate part 117. The tracks 91, 92 each comprise a first saw tooth shape 51 and a second saw tooth shape 52. While these shapes 51, 52 have the same wavelength and amplitude they are, relative to each other, out of phase. In other words, looking laterally across the surface 90, the crests of the shape 51 are displaced  $180^\circ$  with respect to the crests of the shape 52.

Associated with the handle 12 is a vacuum pump 14. The vacuum pump 14 comprises a balloon or bladder 15 which may be compressed and released by the movement of plate 16 hingedly attached to the handle 12 at 17. The balloon 15 has an opening into which is inserted a tube 18. Downstream of the opening, the tube 18 bifurcates into a forwardly disposed tube 19 and a rearwardly disposed tube 20. The shape and configuration of the tubes 18, 19, 20 is such as to enable them to fit into the bores 130 and 111 which have a similar shape.

The most forwardly disposed section 22 of the tube 19 terminates at the free front end of the element 114. The rearwardly disposed tube 20 terminates in a valve 21 which is in a normally closed condition and which projects through the opening 110. The diameter of the through tubes 18, 19, 20 is approximately 3mm except at the end 22 where the diameter is approximately 4mm.

As will be observed from Figure 6 of the drawings, the device 10 may be constructed from two halves. Indeed, it is preferable that the device 10 be constructed in two halves which are capable of being  
5 releasably joined together. By providing a two-half construction such that the bores 130 and 111 become longitudinally exposed, it is possible to quickly and easily remove the tubes 18, 19, 20 and the balloon 15 and replace them with a similar arrangement.

10 With particular reference to Figures 10-16 and 21, the barrel 11 also includes a replaceable cartridge 30 comprising a rigid tubular body 31 having a throughbore 32, a forward end 38 and a rear end 39. The body 31 is a snug fit around the member 115, the  
15 rear end 39 being inserted in the circular opening 118.

A fabric tube 42 snugly surrounds the body 31, and a plurality, preferably up to five, rubber bands 33, 34, 35, 36, 37 are stretched circumferentially around the fabric tube 42 coaxial with the bore 130,  
20 the bands being equally spaced apart in the longitudinal direction of the barrel by a distance equal to one half the distance between consecutive peaks (or troughs) of the saw tooth shapes 51, 52.

The fabric, which is preferably nylon or  
25 polyester, enjoys radial elasticity but has little or no axial elasticity. Near the end 38 of the body 31, there is provided an O-ring 60 of non-flexible construction the external diameter of which is such as to provide a slidable fit for the O-ring 60 inside the

bore 32. A forwardly projecting portion 66 provides a surface on which one end 43 of the fabric 42 may be attached. This attachment may be achieved by suitable adhesive and/or a second O-ring 65. The portion 66 is preferably integral with the O-ring 60. Projecting rearwardly from the O-ring 60, integral therewith and diametrically disposed thereon is a pair of rods 62, 63. The rods 62, 63 extend rearwardly beyond the body 31 through the bores 119, 120 and 121, 122 respectively, each of the rods 62, 63 terminating in respective portion 82, 83 having a diameter greater than that of the rods 62, 63.

It will be clear, therefore, that if the rods 62, 63 are moved or pulled in the direction of the rear end 39 of the body 31 from the position shown in Figure 14 of the drawings to that shown in Figure 15 of the drawings, the effect will be to pull the fabric 42 progressively towards and around the free end of the body 31 inwardly towards the longitudinal axis of the barrel, and rearwardly into the bore 32. The purpose of this will be described later in the specification.

With particular reference to Figures 17-21 of the drawings, there is shown the trigger mechanism 13.

The trigger mechanism 13 comprises seven basic components viz. an upper part 161, a trigger cap 162, plungers 131, 132; main body part 163; fork elements 141, 142, a fork bushing 164 and a finger tip actuator 165.

The trigger mechanism 13 is of well-known construction and its assembly can be easily understood from Figures 17-20.

The plungers 131, 132 operate identically and  
5 thus only one of them needs to be described.

Thus, and with reference to Figures 28 and 29 of the drawings, the plunger 131 comprises a base portion 133 and an upright portion 134 integral therewith forming an inverted T-shape. The upright portion 134  
10 terminates in a relatively narrow point 135. The point 135 is positioned so as to be biased into engagement with the shape 51 of the barrel 11 by the spring 137.

Thus, the plunger 131 and the shape 51 act in the manner of a cam and cam follower respectively; the  
15 plunger 132 and the shape 152 also act similarly.

Thus in Figures 24 and 25, there is shown the plunger 131 and the shape 51; in Figure 26 and 27, there is shown the plunger 132 and the shape 52. It will be observed from Figures 24 and 26 that when the  
20 device 10 is in a first condition of use, the plunger 131 is at the first crest of the shape 51 while the plunger 132 is in the first trough of the shape 52.

It is possible, therefore, for the body of the barrel 11 to move transversely relative to the point  
25 135 (and hence relative to the trigger mechanisms 13).

As each fork element 141, 142 is identical, only one needs description.

Thus, the fork element 141 comprises a square shaped element 143 which terminates in a u-shaped upper

part 144 having a diameter such that the rod 62 can rest thereon. The end 80 of the rod 62 is positioned so that the fork 141 is positioned between the end 80 and the cartridge 30.

5           With particular reference to Figure 28, the fork element 141 has a central part 145 which is of wider dimension than the upper part 144. Below the central part 145 is an intermediate part 146 the dimension of which is less than the dimension of the central part  
10 145 thereby providing a seating 147. Further down the fork element 141 there is provided a bottom part 148 which has a dimension less than the diameter of the intermediate part 146. The bottom part 148 terminates is a flat surface or bottom 149.

15           The intermediate part a 146 is located in a chamber 150 the dimension of which is approximately equal to that of the central part 145. In the chamber 150 and surrounding the intermediate part 146 is a coil  
20 spring 151. One end of the coil spring 151 rests on the base of the chamber 150; the other end of the spring 151 rests against the seating 147. Thus, the spring 151 tends to urge the fork 141 upwards thereby maintaining the rod 62 in place in the upper part 155.

          Surrounding the bottom part 148 and attached  
25 thereto is an actuator 165 having a sloping surface 166. The sloping surface 166 enables an operator using his nail or finger to pull the actuator 165 downwards thereby pulling the fork element 141 against the bias

of the spring 151 so as to release the rod 62 from the upper part 144.

The device 11 functions as follows.

The device 11 is separated into its two components (Figure 6) and the balloon 15; associated tubes 17-20; and valve 21 are placed in position. The two components are joined together and the trigger mechanism 13 mounted on the intermediate part 117 so that the points 135 of the plungers 131 and 132 are located relative to the respective shapes 51, 52 as shown in Figures 24, 25. Thus the trigger mechanism 13 is positioned relative to barrel 11 so that it is adjacent the face 127. The cartridge 30 is now offered to the device 11 so that the rods 62, 63 are threaded through respective bores 119, 120 and 121, 122 and exit through respective openings 123, 124. Next, the portions 82, 83 are threaded through the respective apertures 170, 171. The actuator 165 is pulled downwards so as to enable the portions 82, 83 to pass beyond the respective upper parts 144 of the fork elements 141, 142. The actuator 165 is now released so that the fork elements 141, 142 are biased upwardly by the spring 151 thereby allow the upper parts 144 of each fork element 141, 142 to engage with the respective rods 62, 63 on the cartridge side of the rods 62, 63 (Fig. 28). The device 11 is now ready for use.

With the anoscope in one hand and the device 10 in the other, the anoscope is inserted into the anus so

as to locate the haemorrhoids. When located, and while holding the handle 12 the barrel 11 is inserted into the anus and the end 38 of the cartridge 30 is offered to a haemorrhoid 50 and when thus engaged, the vacuum  
5 pump 14 is hand actuated so as to establish a reduced air pressure in the bore 130 and thus draw the haemorrhoid 50 into the bore 130 (Figure 32). The trigger mechanism 13 is then actuated to fire the rubber 33 around the haemorrhoid 50 (Figure 32). The  
10 trigger mechanism 13 operates as follows. Bearing in mind that the trigger mechanism 13 can slidably move relatively to the second intermediate part 117, when the finger trigger 167 is pulled, the effect is to move the trigger mechanism 13 rearwardly (relative to the  
15 second intermediate part 117) in the direction of the face 128. Accurate control of this movement is achieved by virtue of the cam/cam follower arrangement of the points 135 in the respective shapes 51, 52. Thus, with reference to Figures 24, 25, as the point  
20 135 of the plunger 131 enters the slope of the first saw tooth shape 51, the spring 137 tends to urge the point 135 upwards thereby causing the point 135 to traverse the surface of the shape 51 until it enters the first trough, a position which can be readily  
25 determined in use by tactile feedback through the handle 12. Simultaneously, and with reference to Figure 26, 27 of the drawings the point 135 of the plunger 132 travels from the first trough of the saw

tooth shape 52 to the second crest of the saw tooth shape 52.

In essence, therefore, the trigger mechanism 13 and the rods 62,63 move rearwardly while the rest of the device 11 remains stationary. The effect of this movement is to draw a length of material 42, which was previously located on the external surface of the cartridge 30, to move into the bore 32 (Figure 15). In doing so, the rubber band 33 moves with that length of material (as do all the other bands 34-37) until the band 32 reaches the most forwardly disposed edge of the cartridge 30 whereupon, by virtue of its elasticity, it is released from the cartridge 30 and embraces the haemorrhoid 50 (Figure 32). Thus, as will now be apparent, the distance between each of the rubber bands 32-37 is substantially equal to the one-half of the wavelength of the saw tooth shapes 51, 52. The vacuum is released by pressing on the valve 21 and the cartridge 30 is withdrawn from the haemorrhoid 50 (Figure 33).

If another haemorrhoid requires treatment, the procedure is repeated for up to the number of rubber bands 33-37 on the cartridge without the need to withdraw the device 11 from the anus.

The barrel 11 is then withdrawn from the anus, the cartridge 30 is removed and disposed.

By now inserting another cartridge 30 onto the barrel 11, the device 10 may be used again. If no bleeding occurred during the procedure, it would not be



necessary to replace the balloon 15, tubes 18-20 or the valve 21. If replacement is required, prior to cartridge 30 replacement, the barrel 11 is split into its components, the existing balloon 15, tubes 18-20 or  
5 the valve 21, are removed and replaced by a new balloon 15, tubes 18-20 and the valve 21.

The invention is not limited to the embodiment described herein which may be modified or varied without departing from the scope of the invention.

## CLAIMS:

1. A device for enabling the treatment of haemorrhoids, the device including a barrel having an opening at a free end thereof, means for releasably retaining at least one rubber band stretched circumferentially around the barrel adjacent the free end, means for drawing a haemorrhoid into the opening, and means for releasing the rubber band off the free end of the barrel onto the haemorrhoid.
2. A device as claimed in claim 1, wherein the means for drawing a haemorrhoid into the opening comprises means for establishing a reduced air pressure in the opening to draw the haemorrhoid into the opening by suction.
3. A device as claimed in claim 2, wherein the barrel has a handgrip at the opposite end thereof to the free end, and wherein the opening is at one end of a longitudinal bore in the barrel which extends from the free end towards the handgrip, the handgrip including a manually operable pump in communication with the bore for establishing the reduced air pressure in the opening.
4. A device as claimed in any preceding claim, wherein the rubber band is disposed on a tubular sheet of flexible material snugly surrounding the barrel, the

sheet being slidable longitudinally of the barrel  
towards the free end thereof, and the releasing means  
comprises means for drawing the sheet around the free  
end of the barrel and inwardly towards the longitudinal  
5 axis thereof.

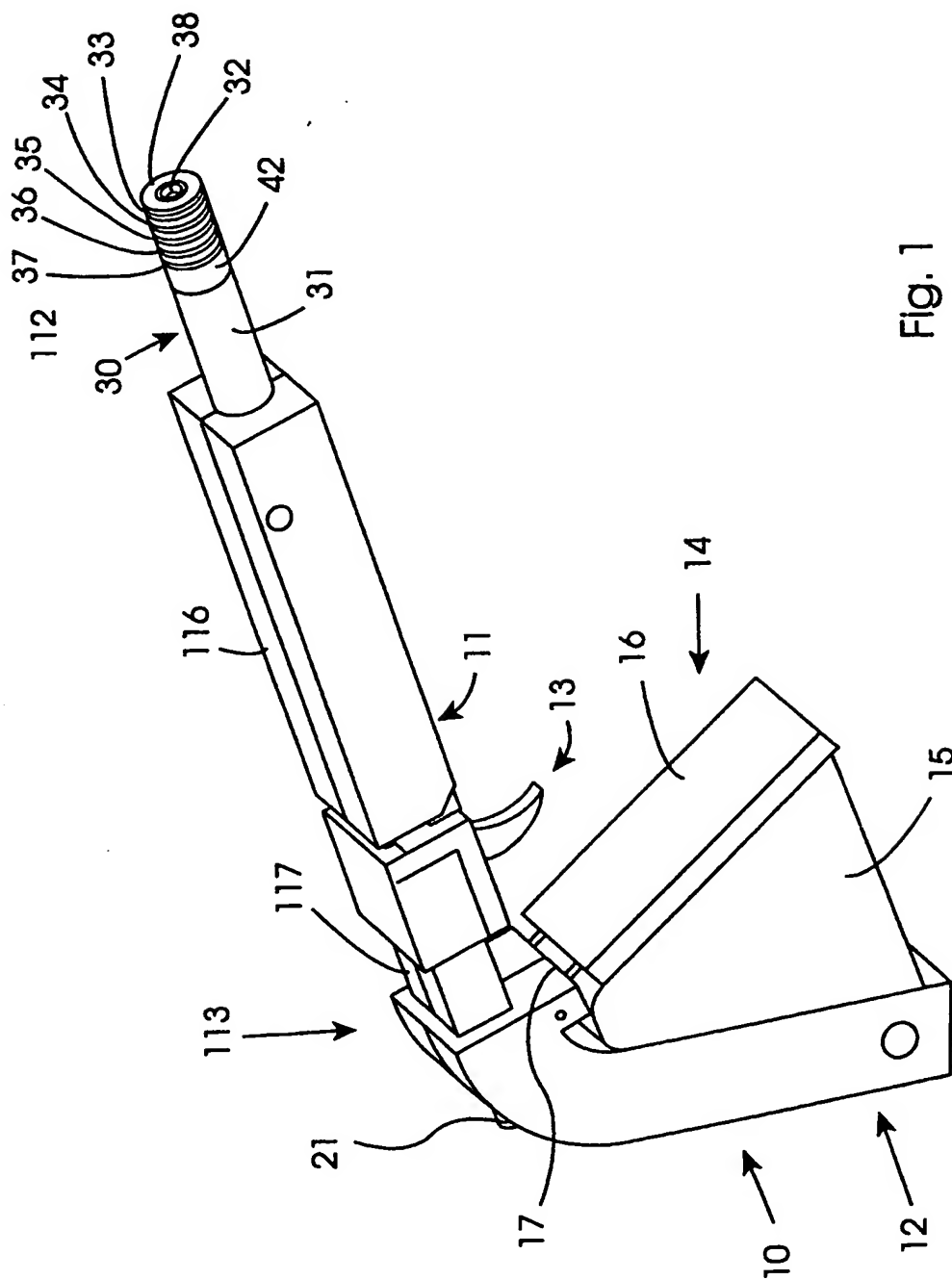
5. A device as claimed in claim 4 or 5, wherein the  
sheet is attached to at least one rod extending  
longitudinally within the barrel towards the handgrip,  
10 the device further including means for pulling the rod  
away from the free end of the barrel to draw the sheet  
around the free end of the barrel.

6. A device as claimed in claim 5, wherein the means  
15 for pulling the rod away from the free end of the  
barrel comprises a trigger mechanism disposed between  
the free end of the barrel and the handgrip.

7. A device as claimed in claim 4, 5 or 6, wherein  
20 the tubular sheet of flexible material is disposed  
around a replaceable tubular portion of the barrel at  
the free end thereof, whereby when the or all the  
rubber band(s) have been released the said tubular  
portion of the barrel can be replaced by a fresh  
25 tubular portion carrying fresh rubber band(s)  
previously loaded thereon.

8. A device as claimed in any one of claims 4 to 7,  
wherein the tubular sheet of flexible material

accommodates a plurality of rubber bands spaced apart in the longitudinal direction of the barrel and releasable consecutively off the free end of the barrel by progressively drawing the sheet around the free end  
5 of the barrel as aforesaid.



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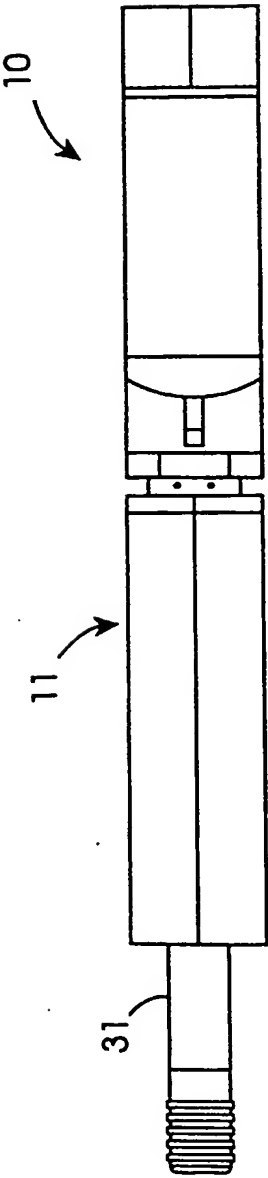


Fig. 3

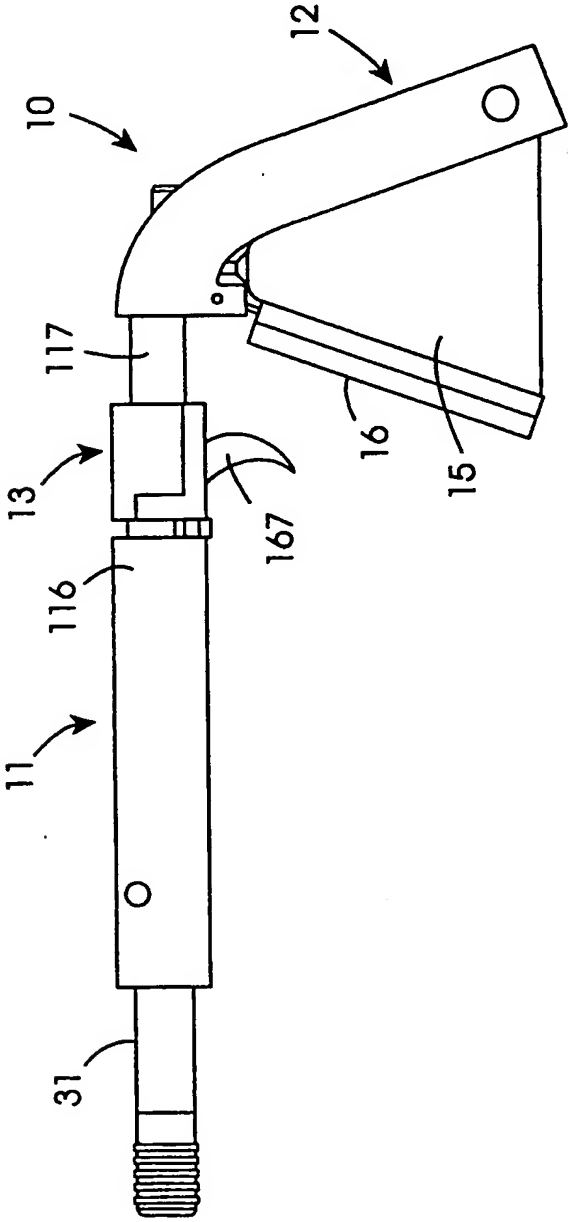


Fig. 2

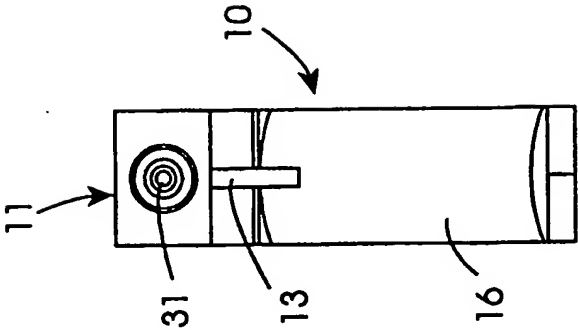


Fig. 4

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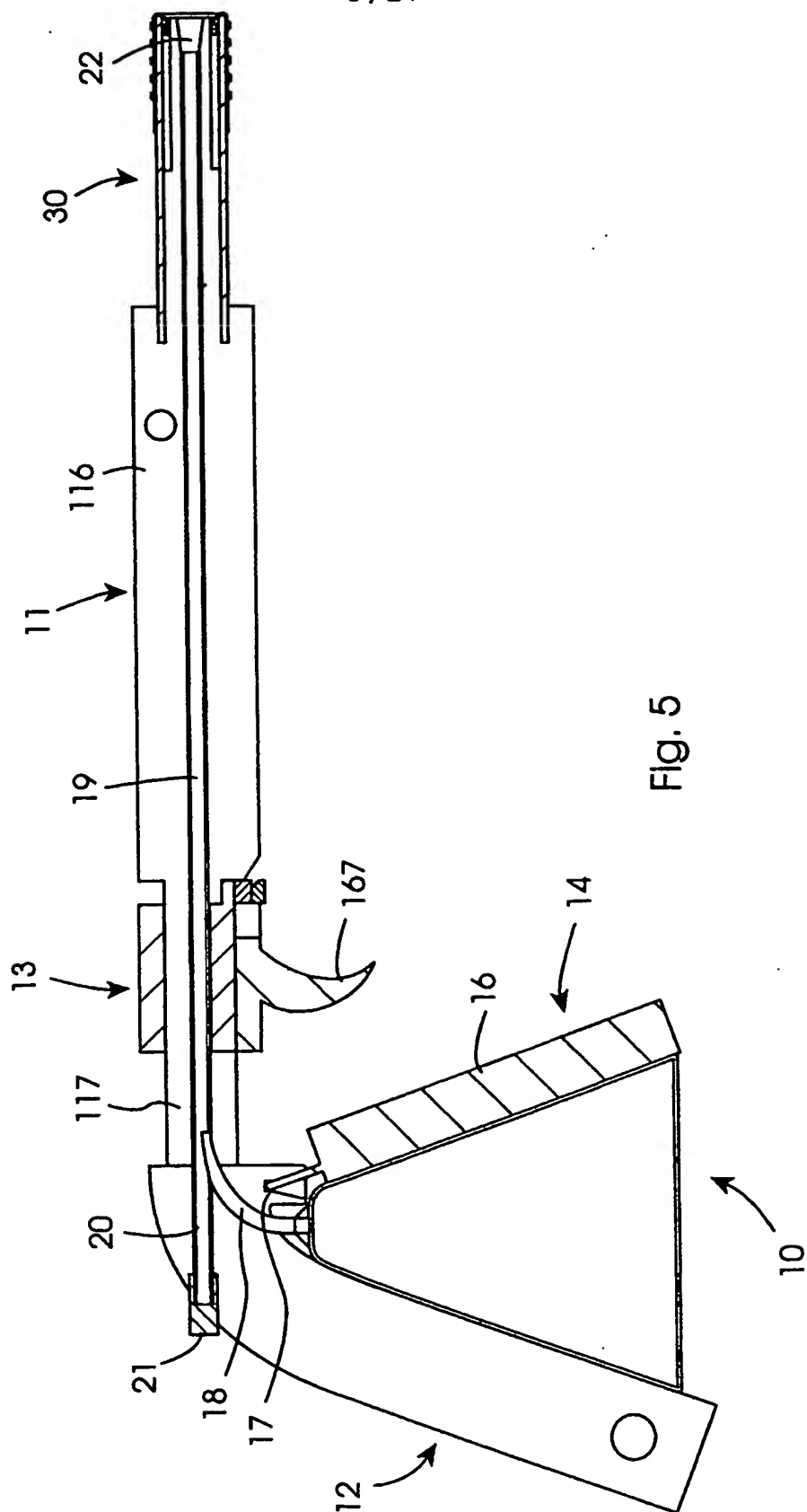


Fig. 5

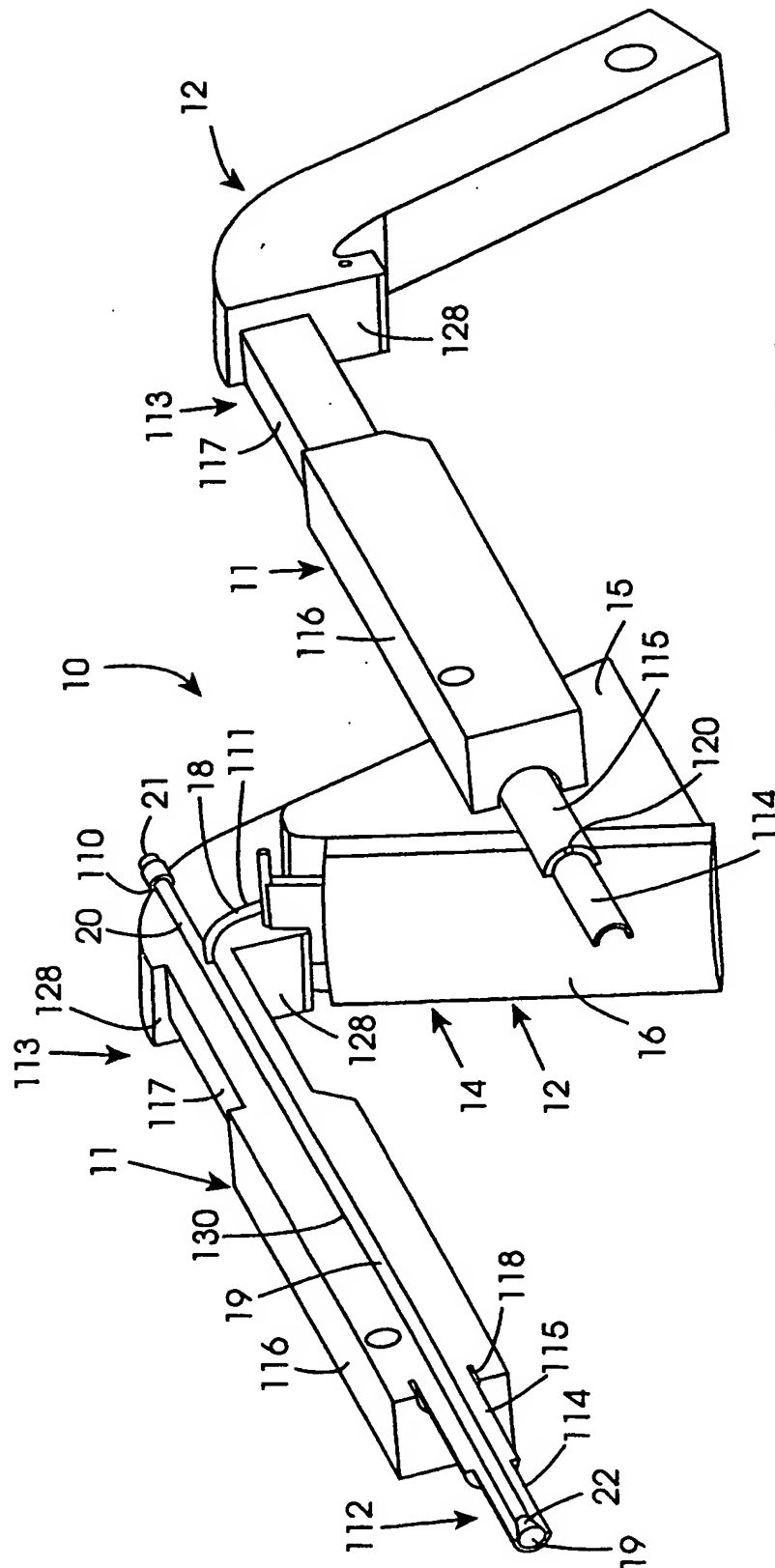


Fig. 6



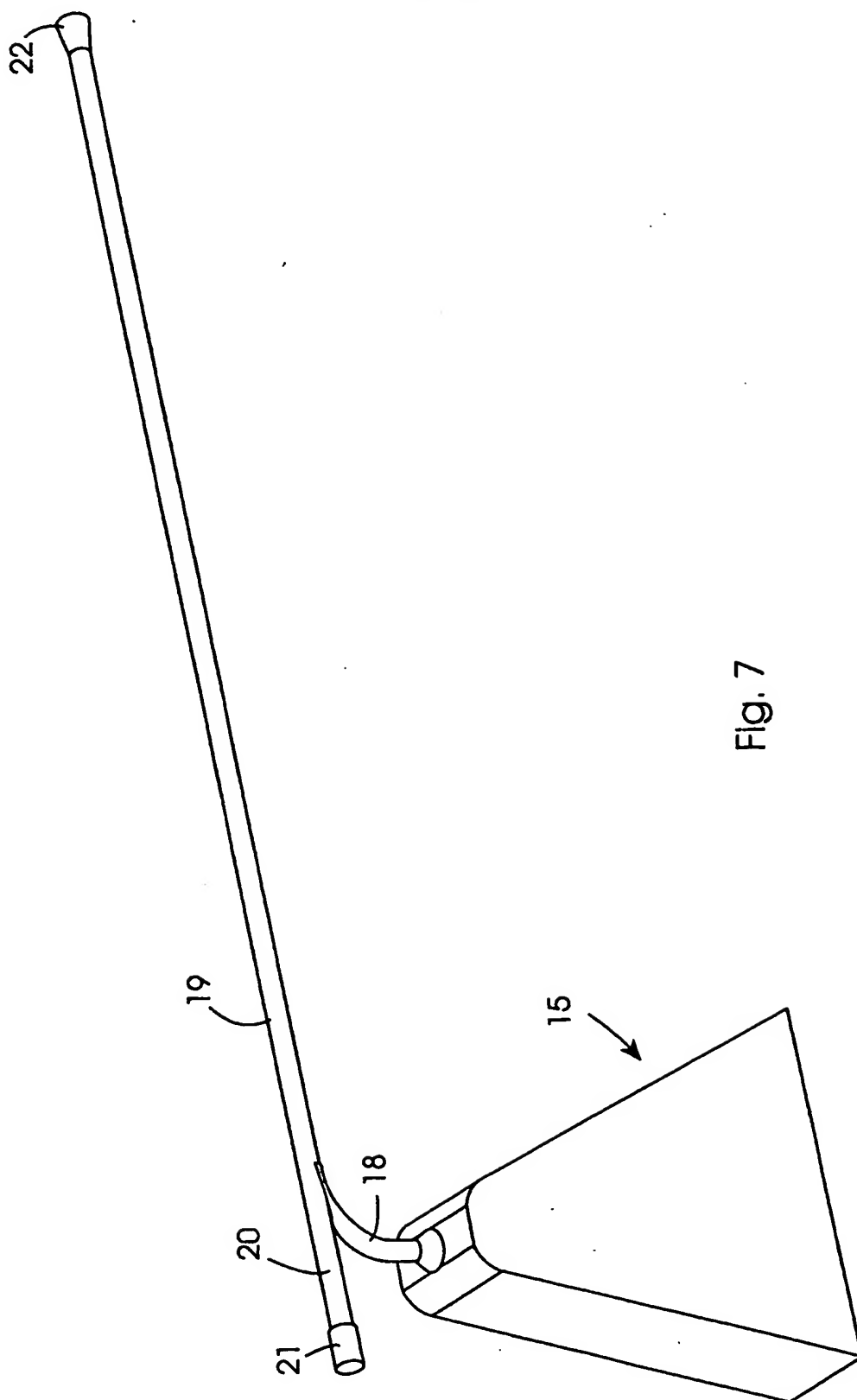
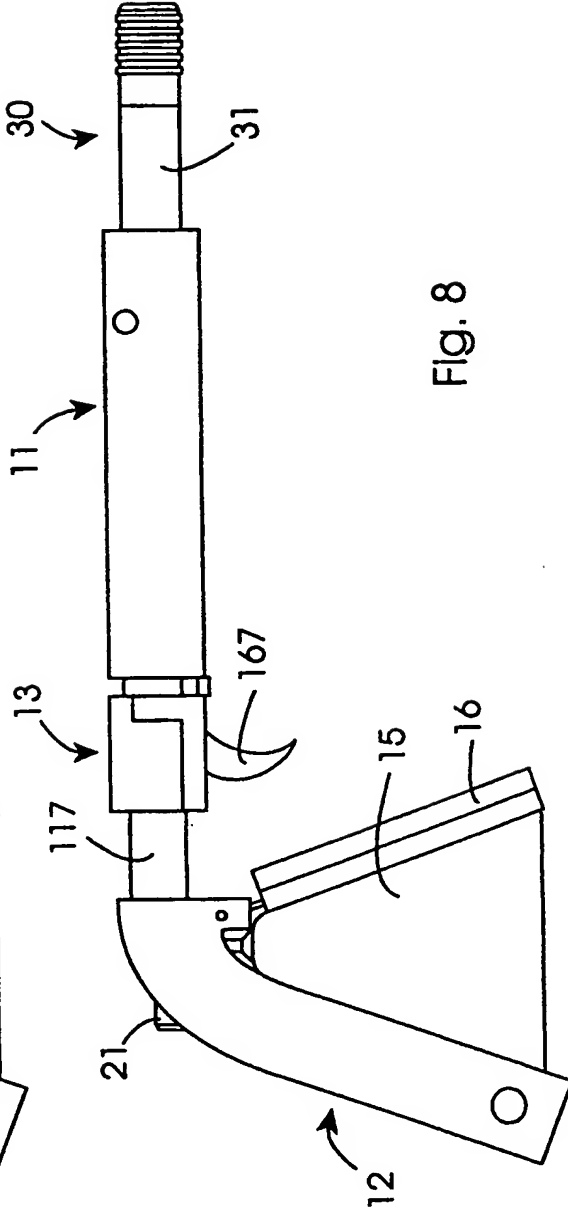
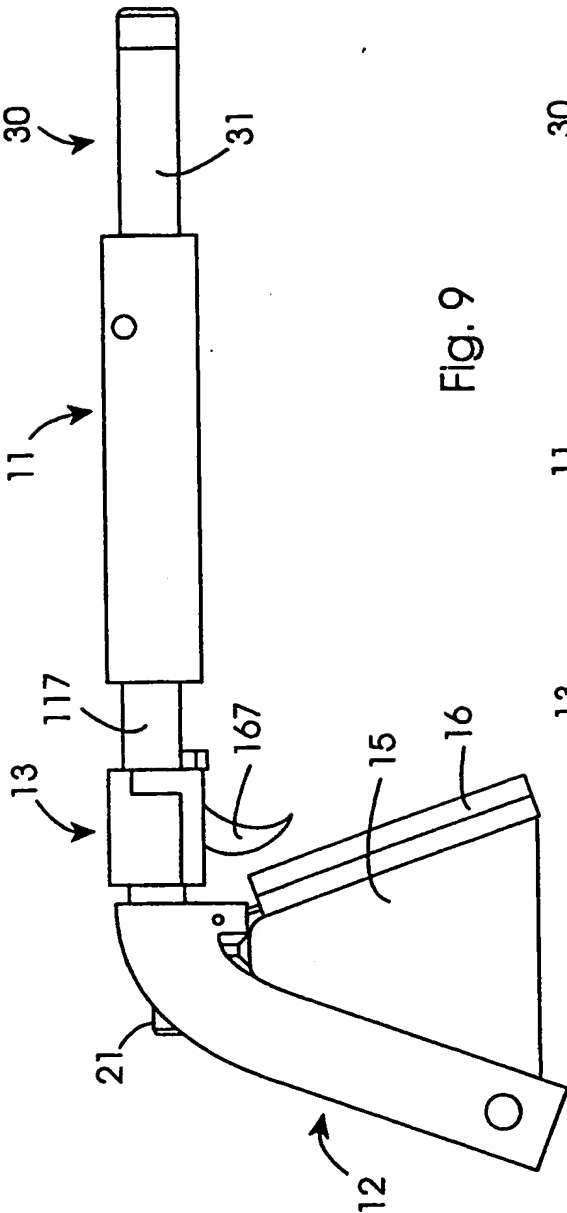


Fig. 7



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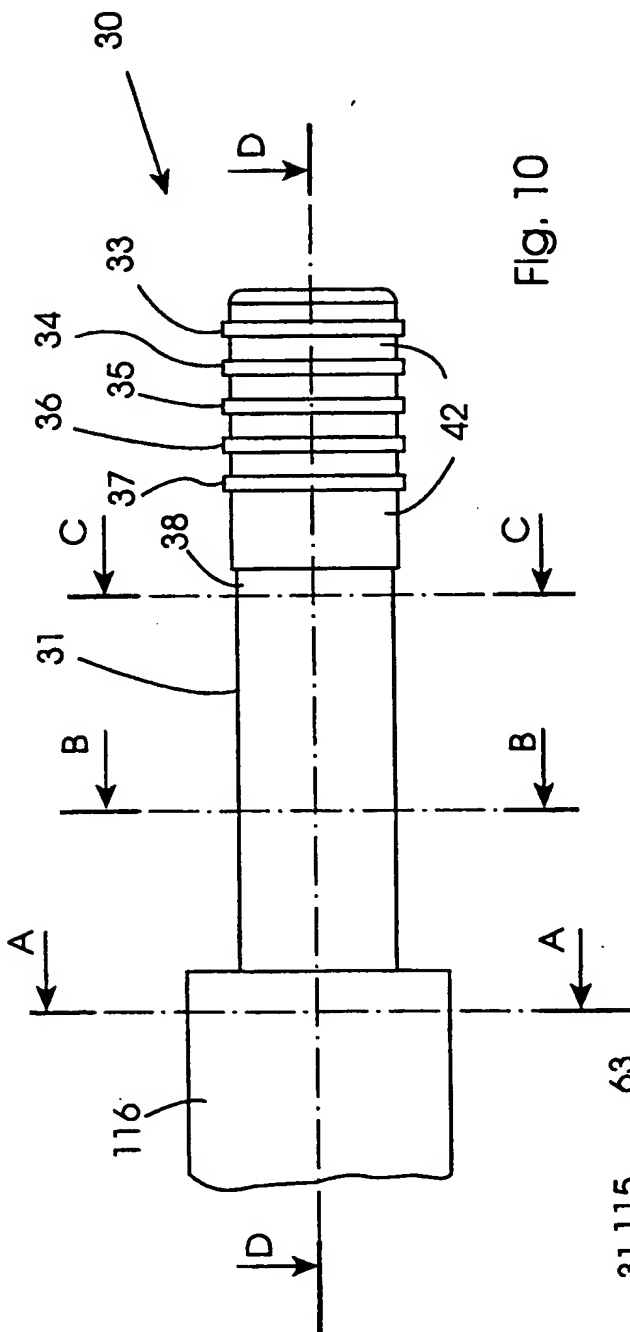


Fig. 10

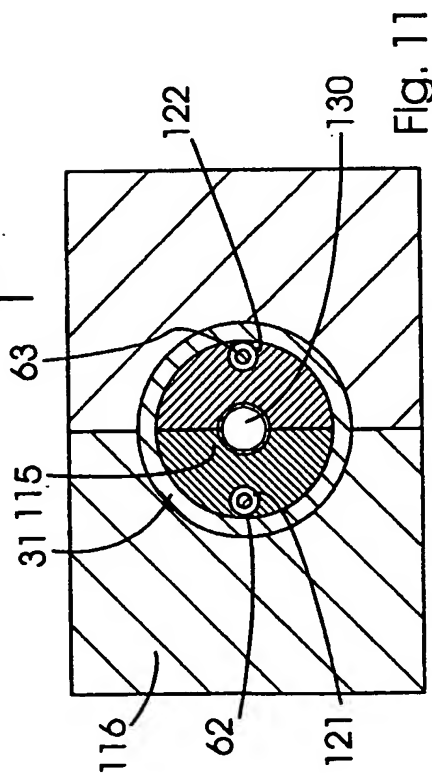


Fig. 11

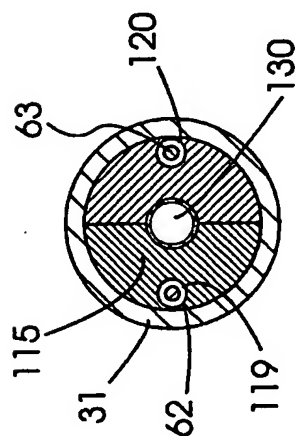


Fig. 12

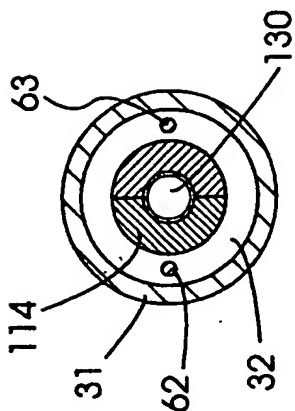


Fig. 13

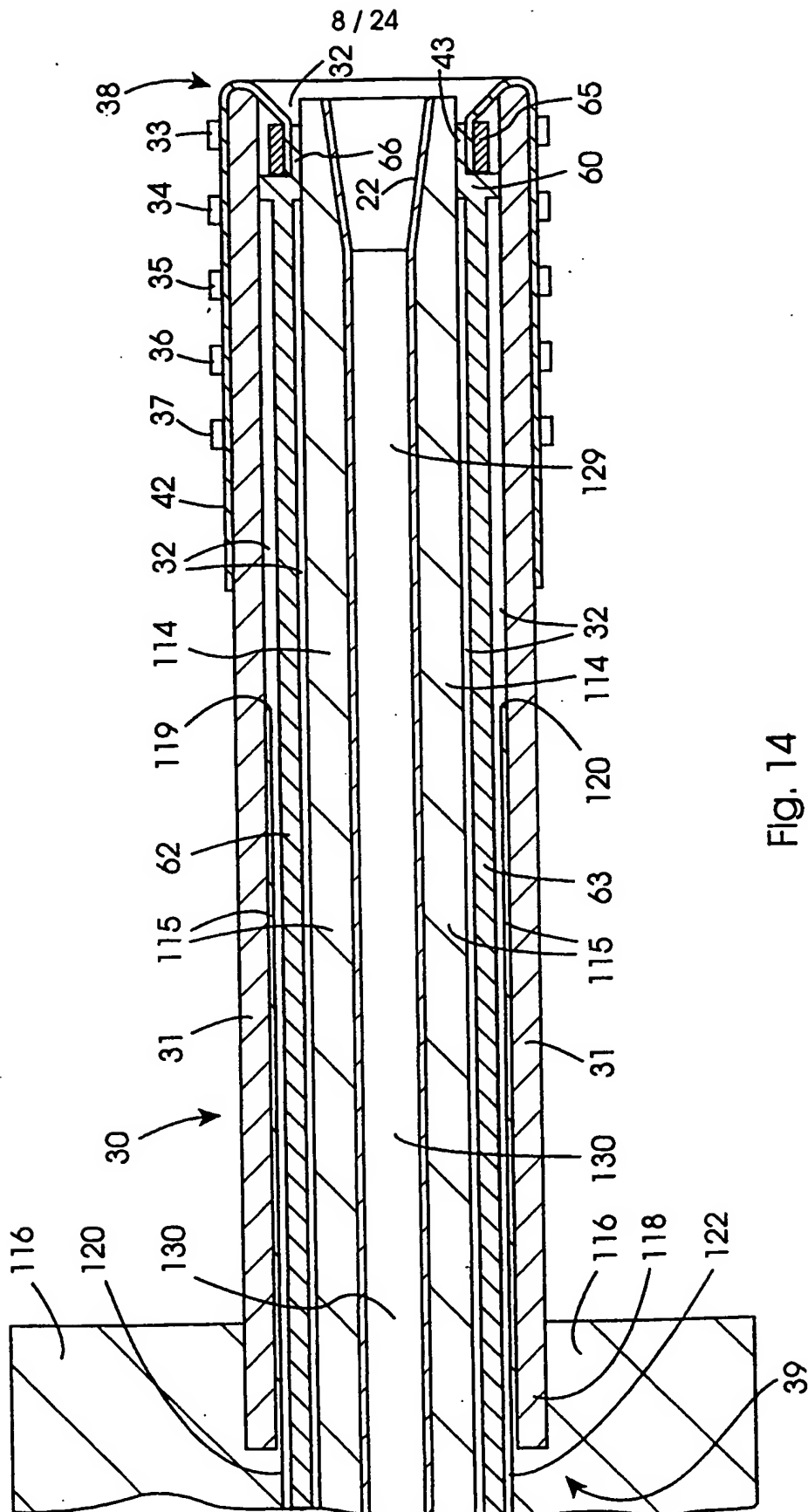


Fig. 14

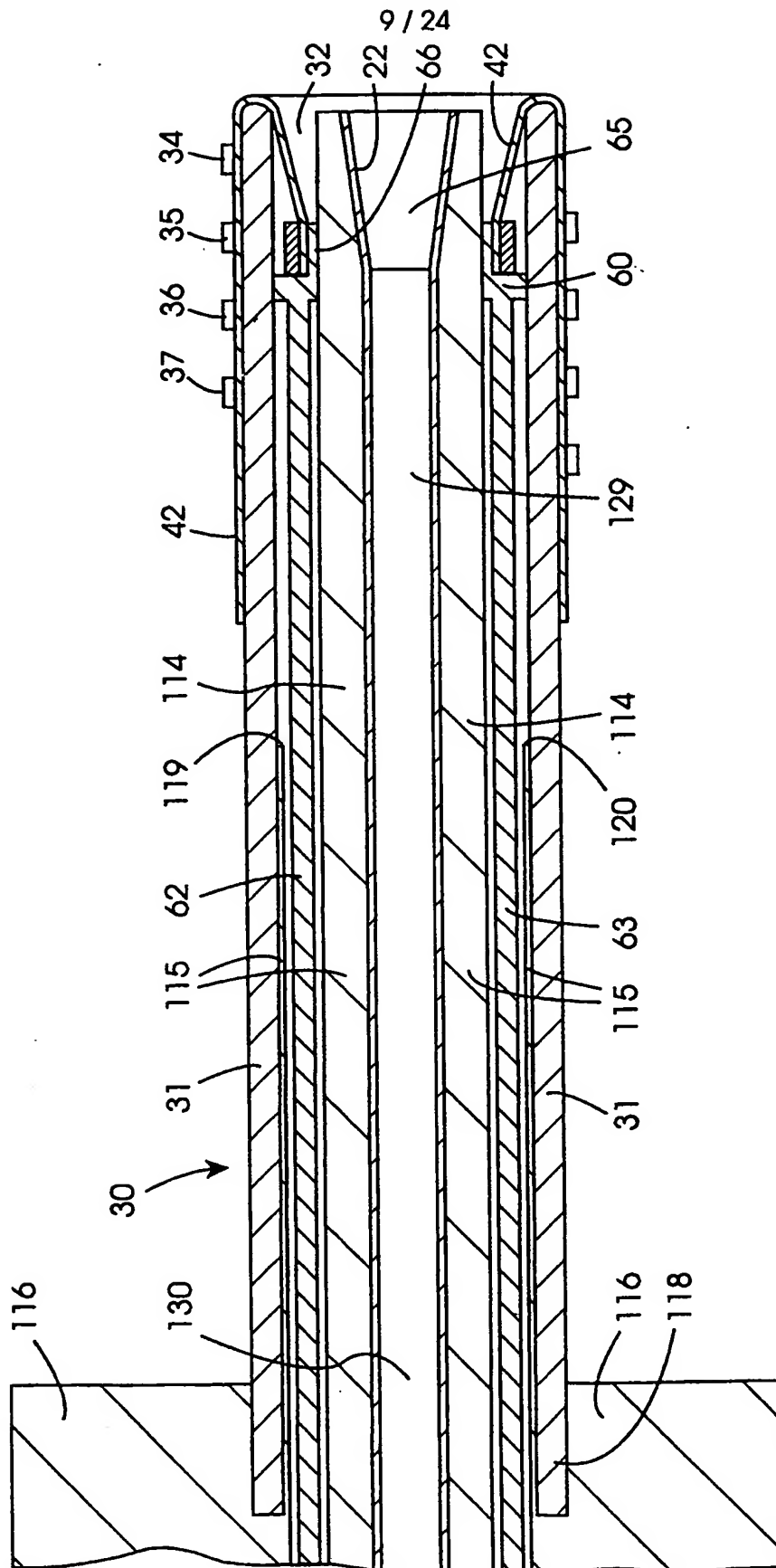
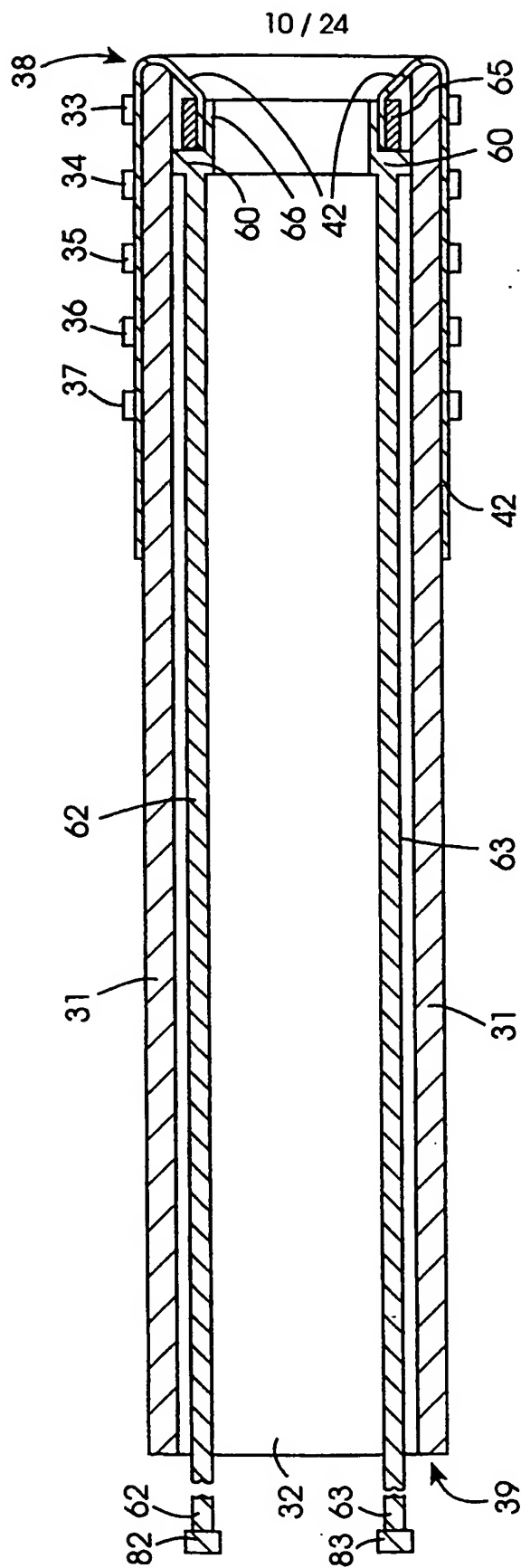


Fig. 15



**Fig. 16**

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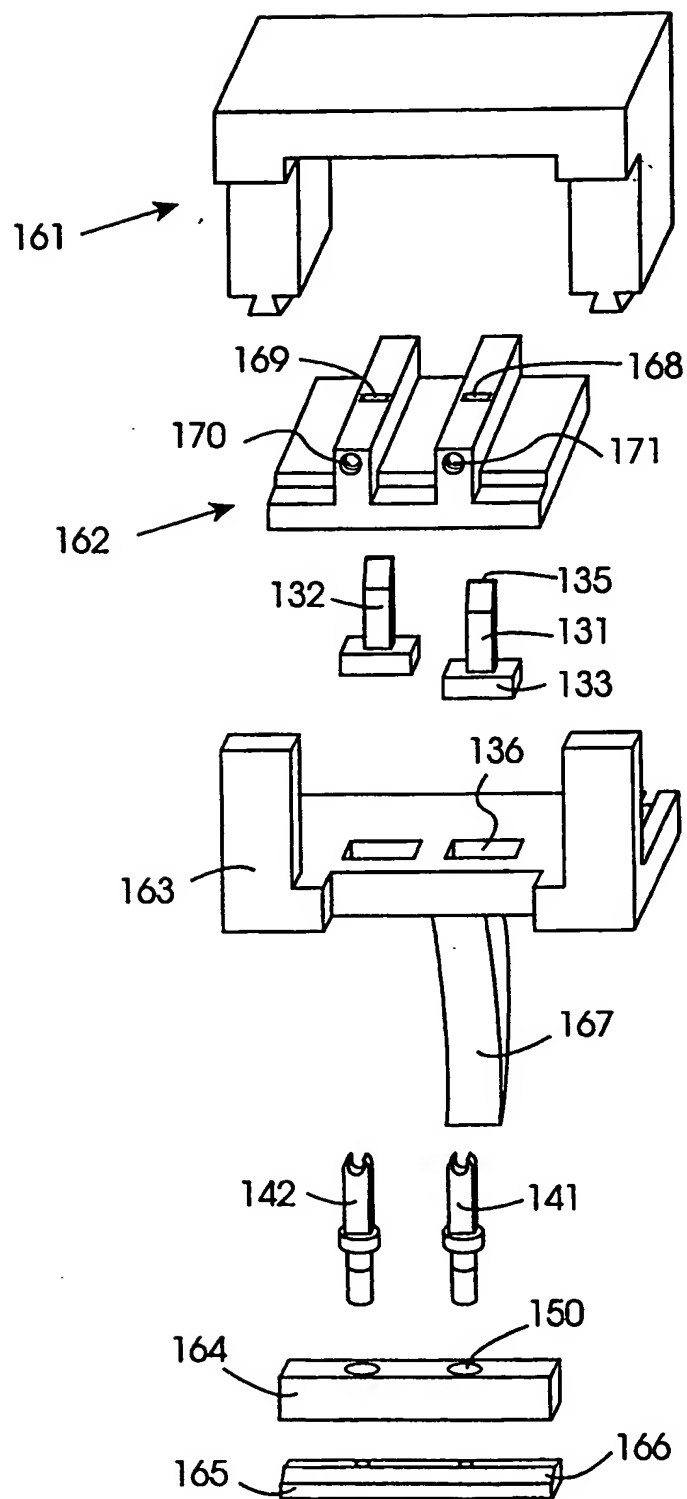


Fig. 17

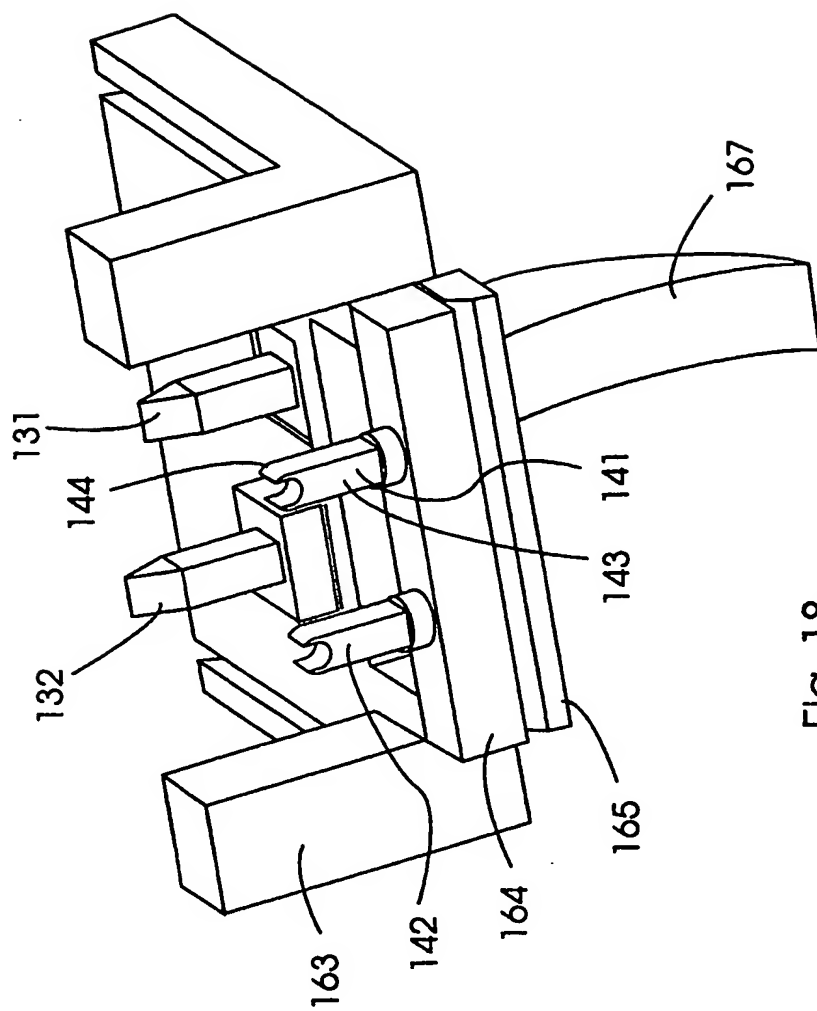


Fig. 18



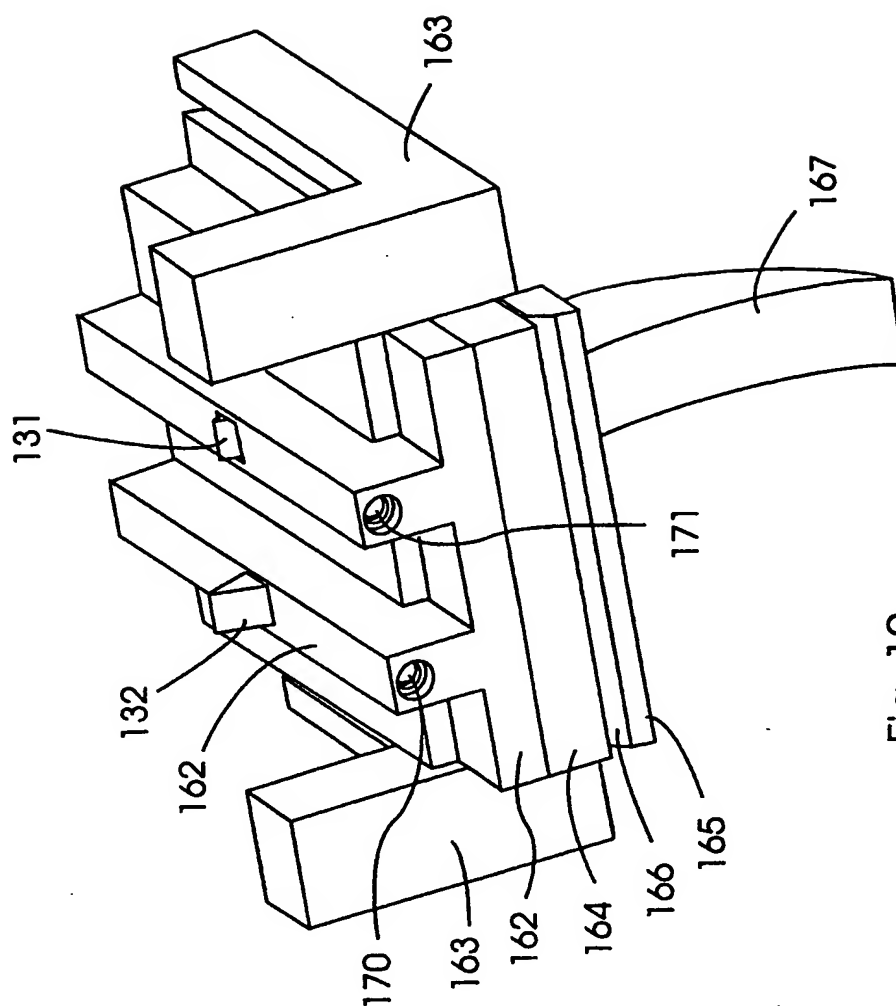


Fig. 19

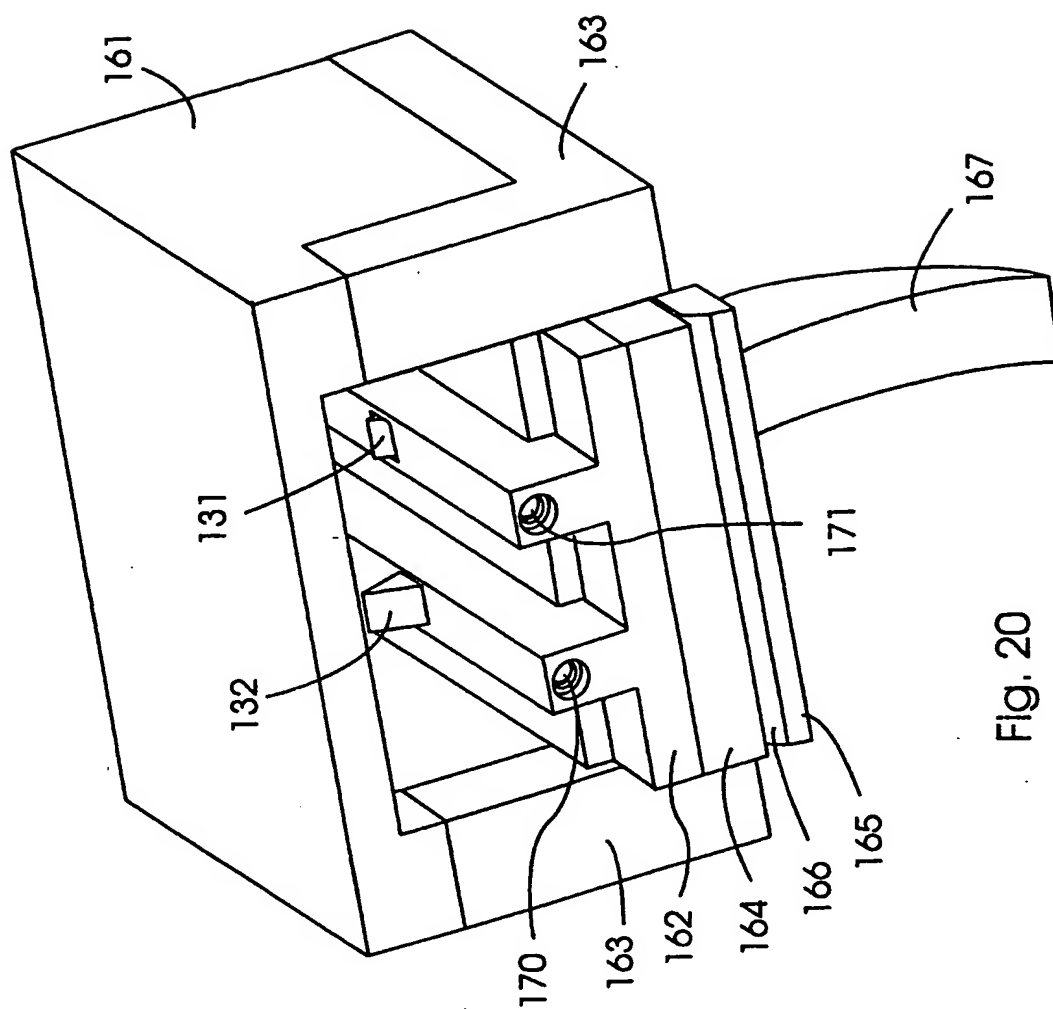
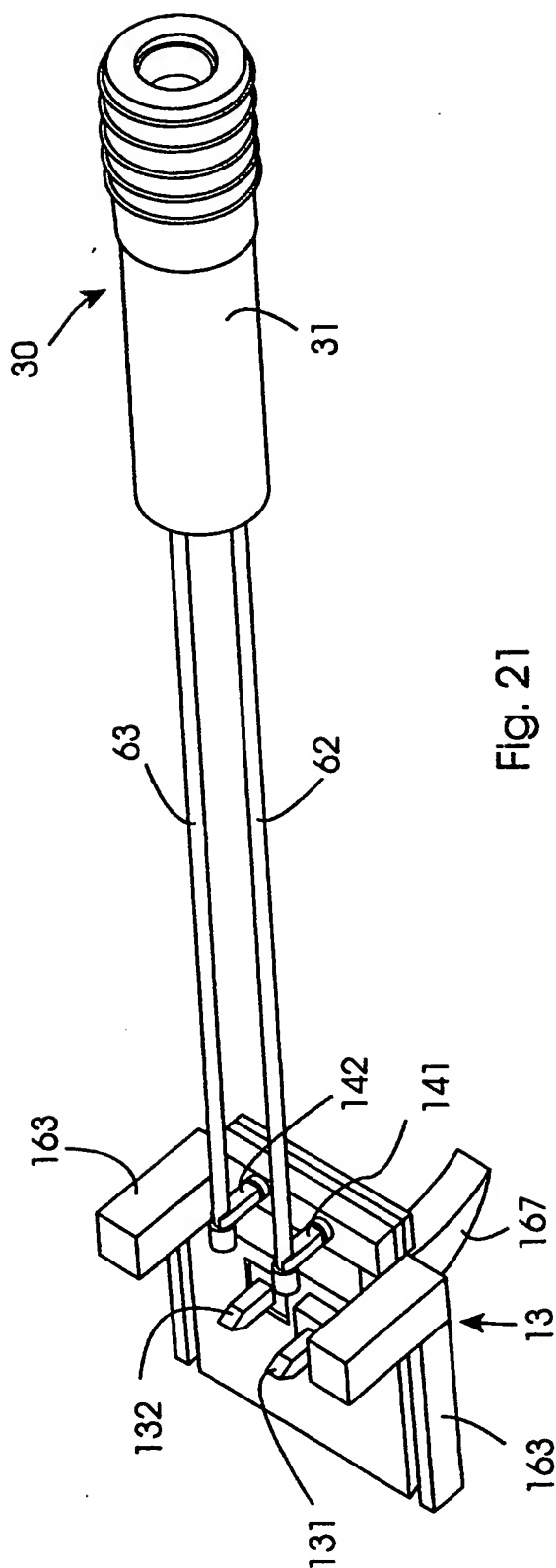


Fig. 20

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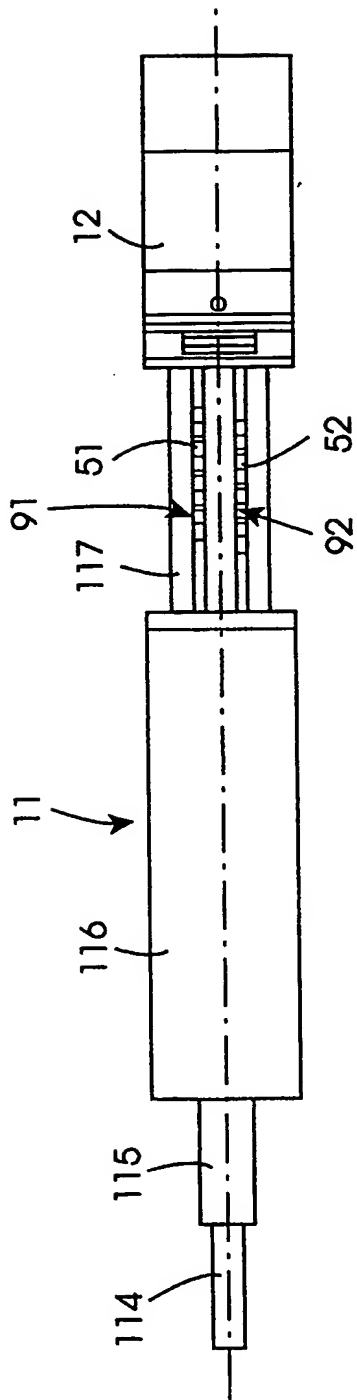


Fig. 22

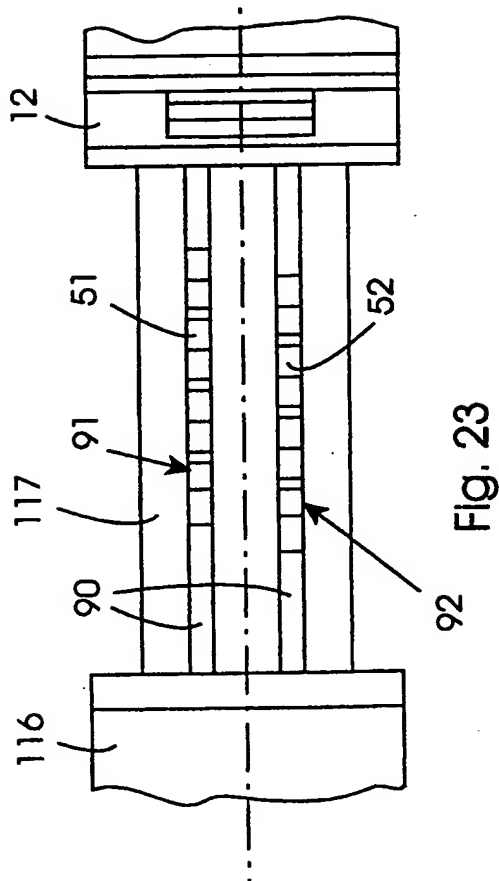
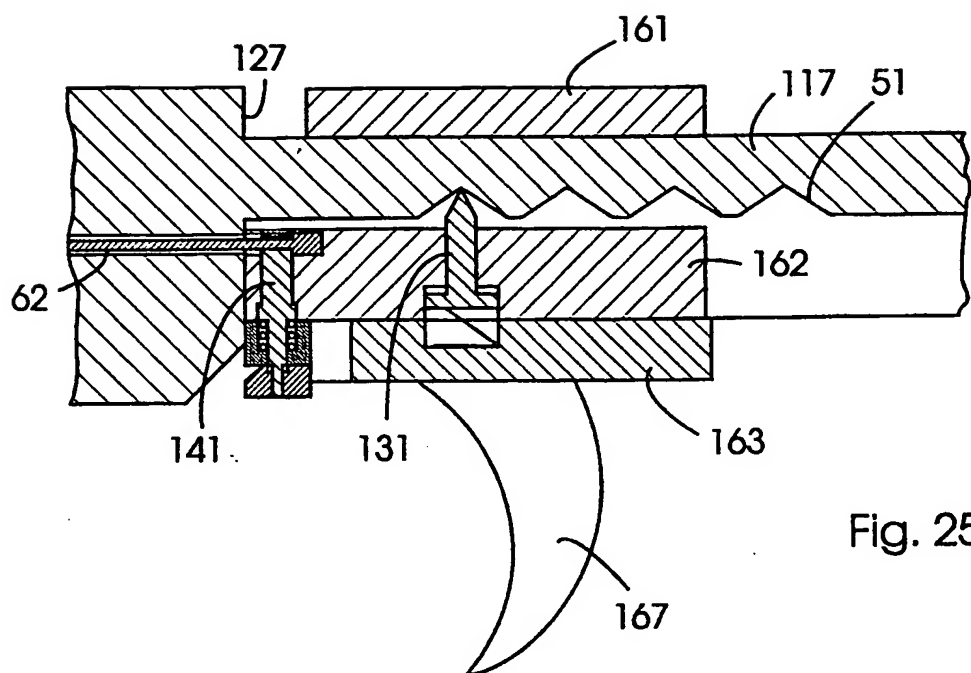
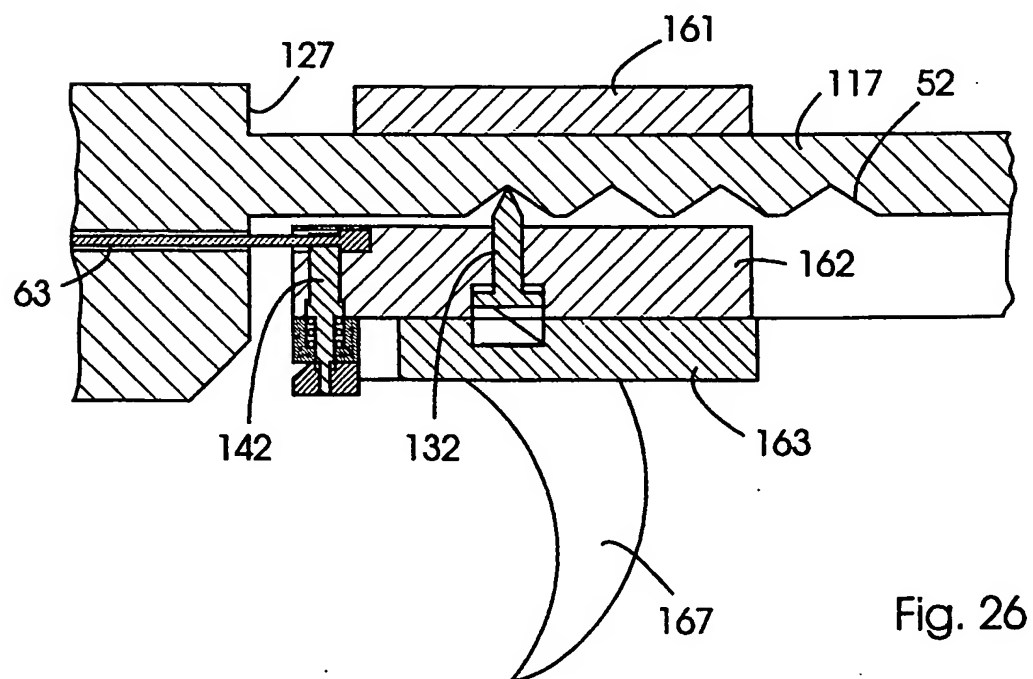
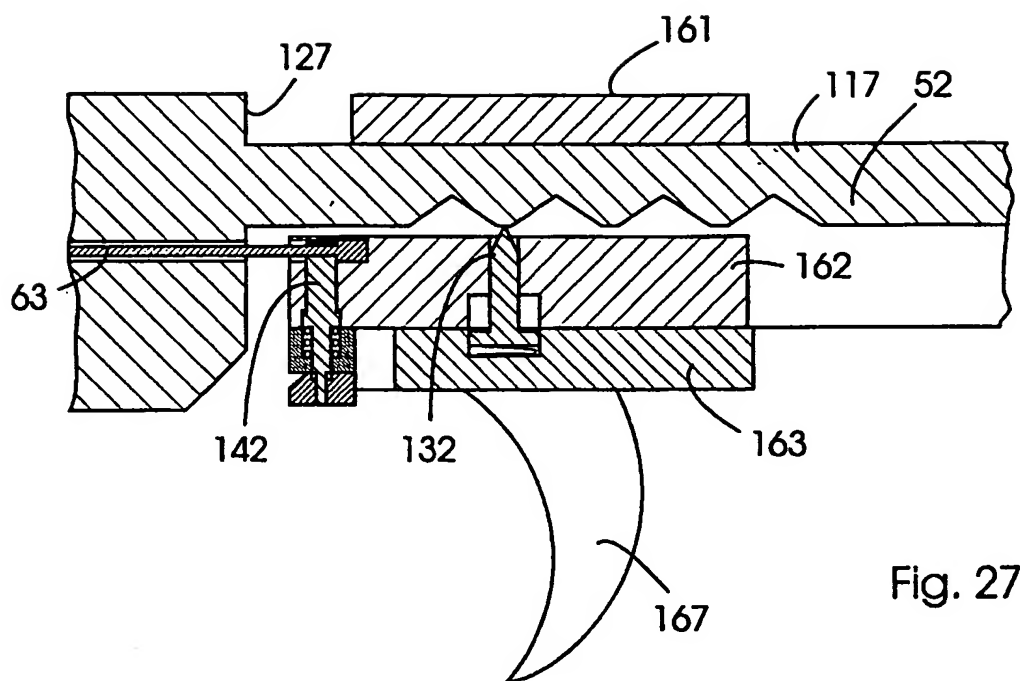


Fig. 23





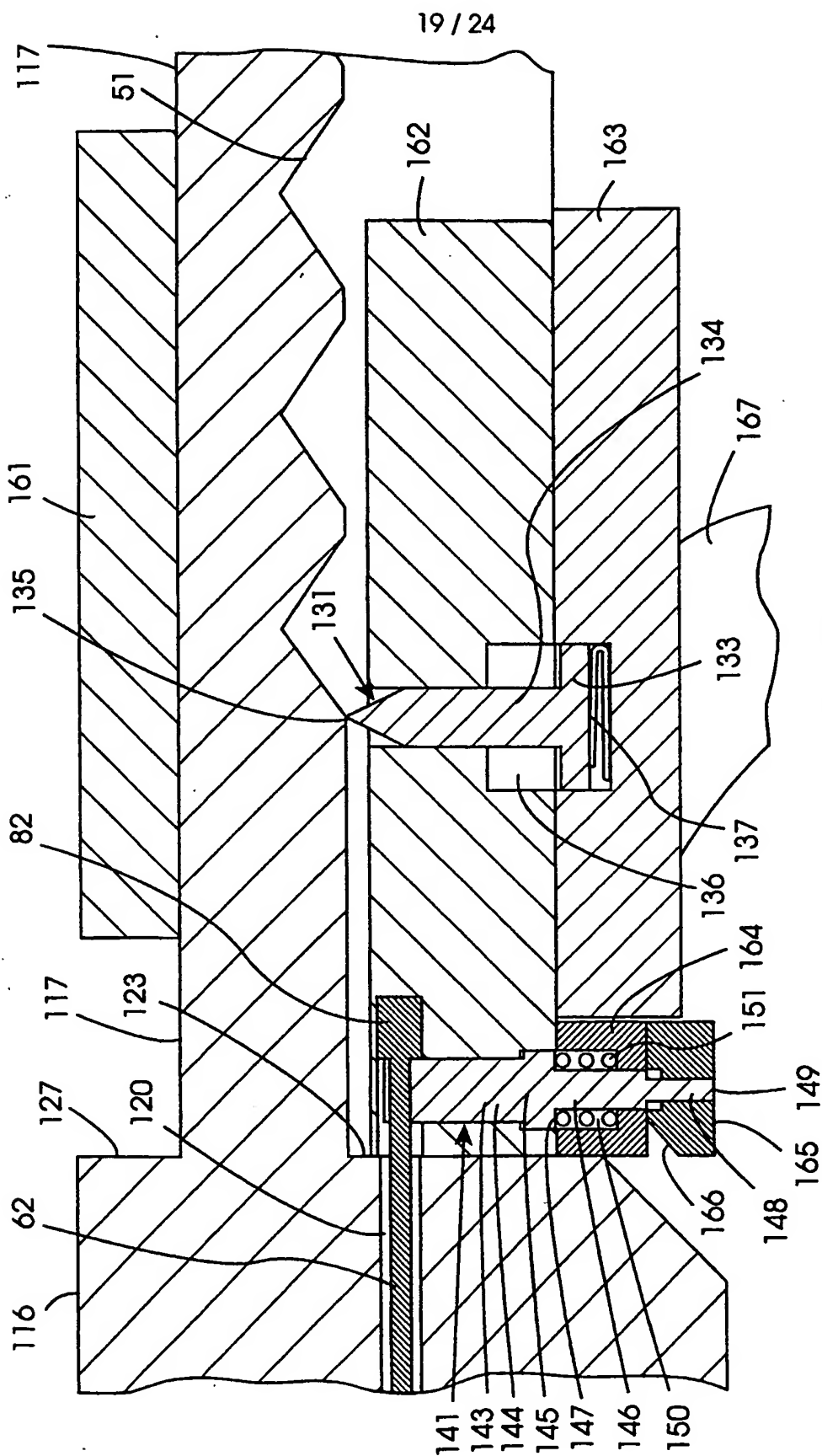


Fig. 28

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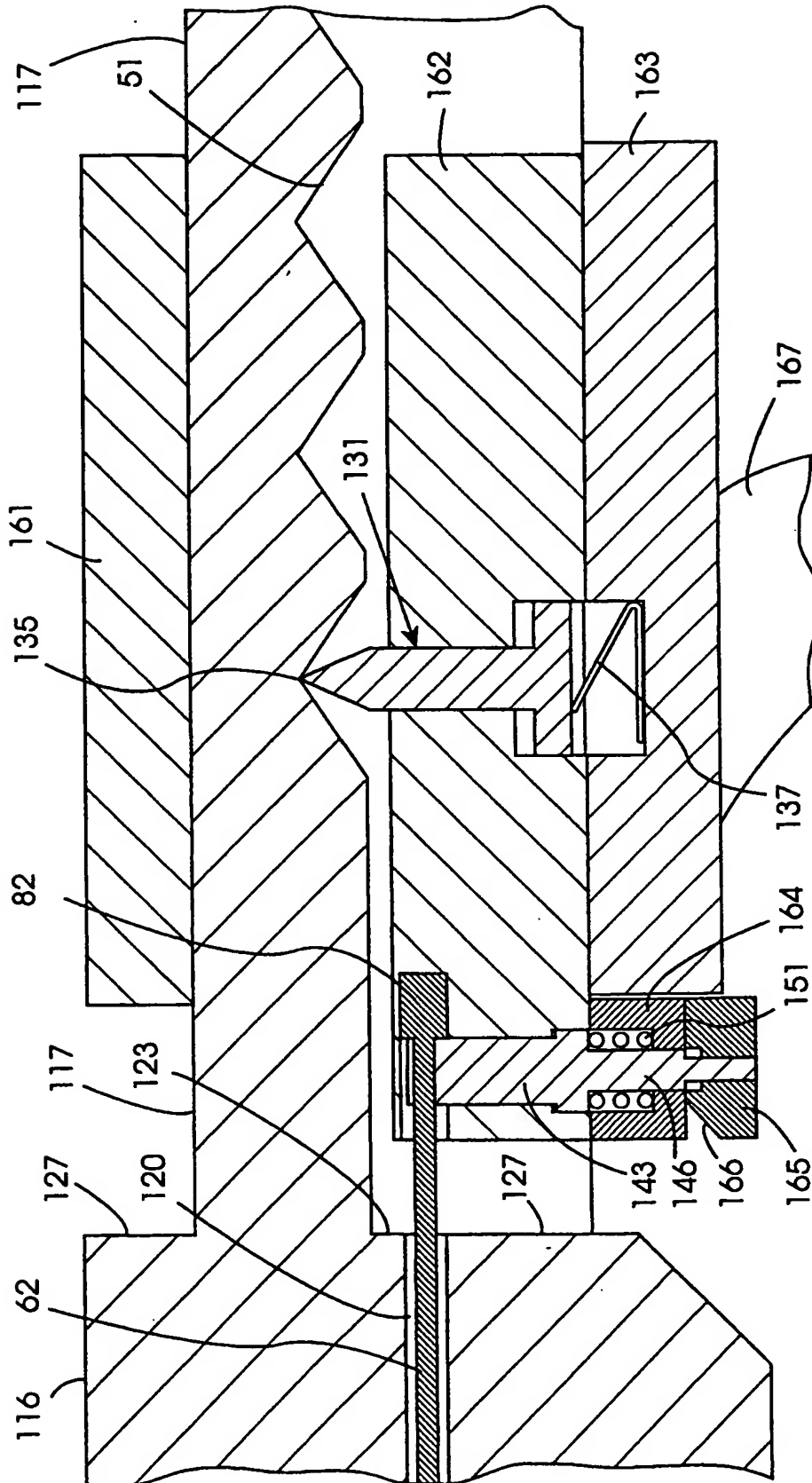


Fig. 29



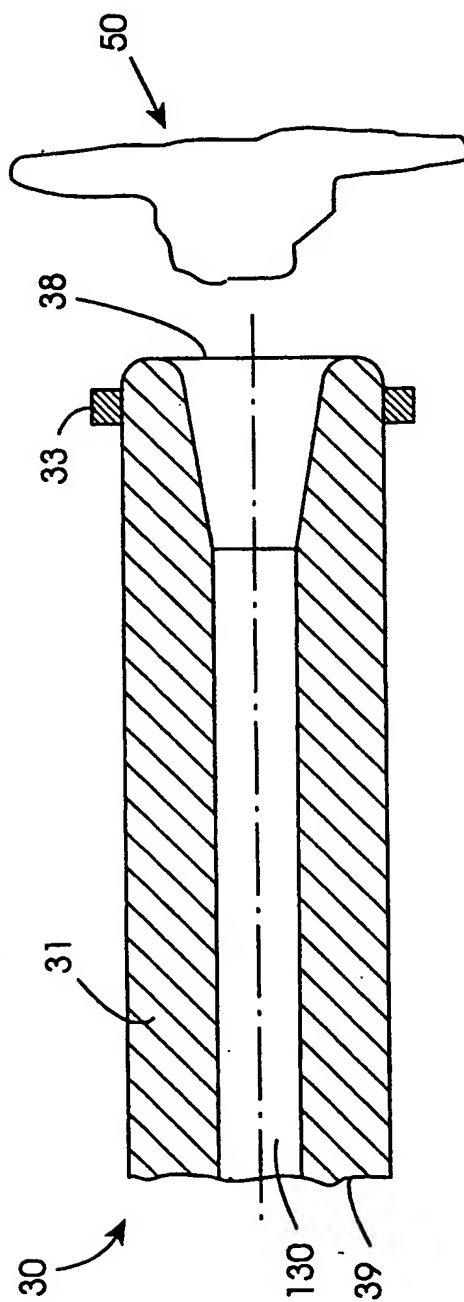


Fig. 30

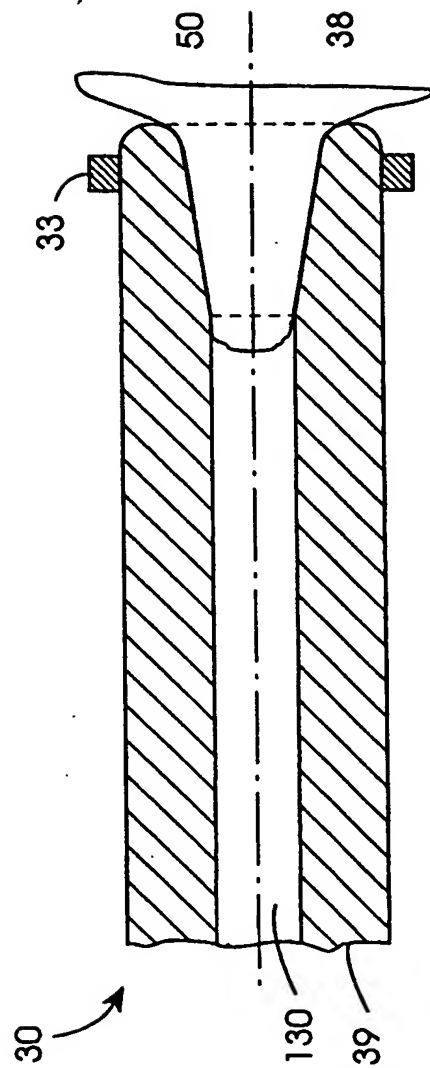


Fig. 31

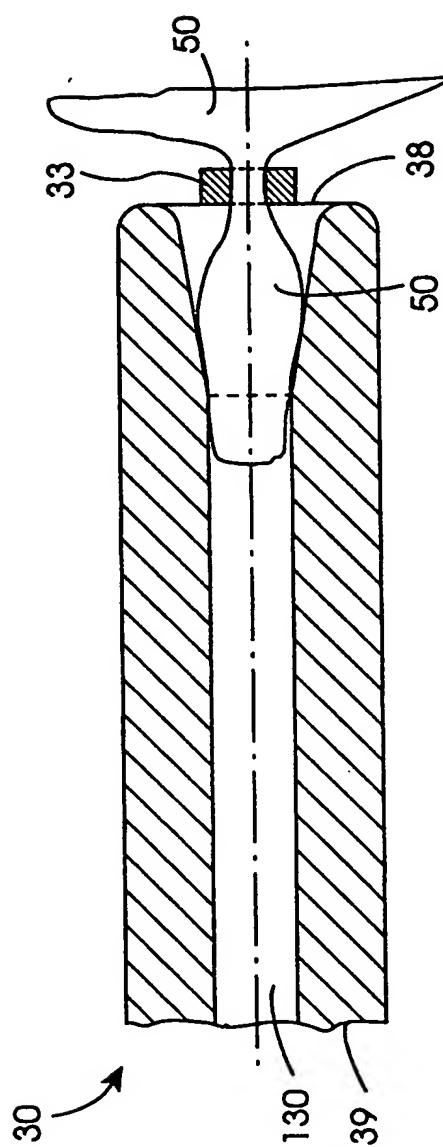


Fig. 32

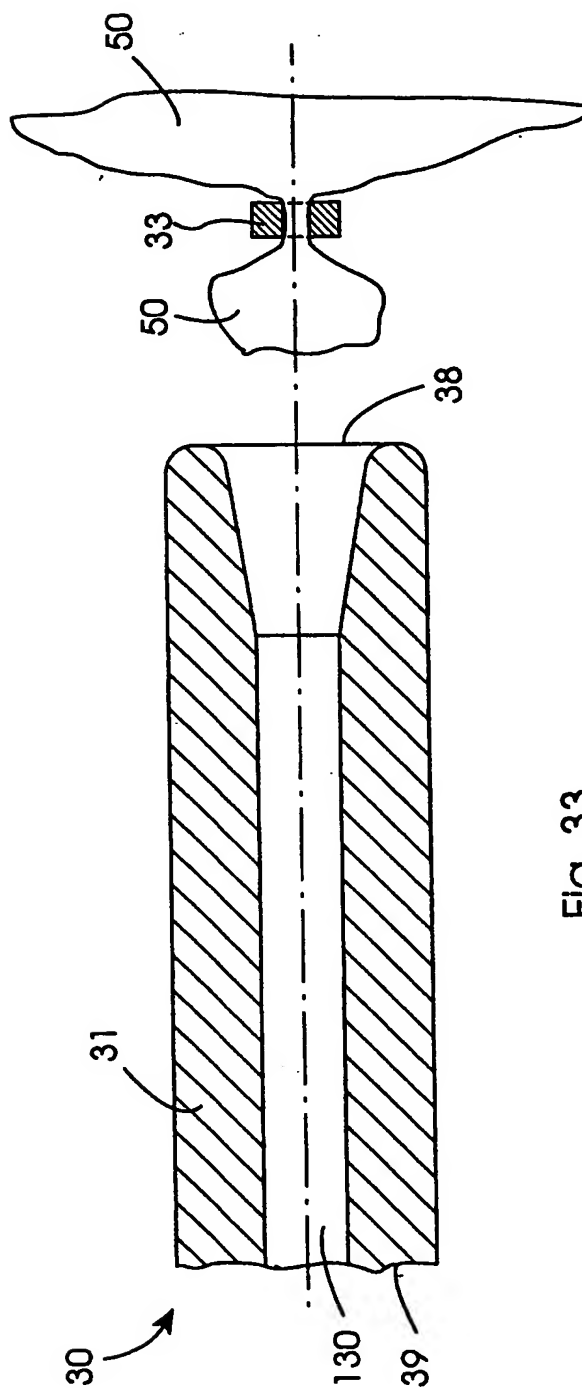


Fig. 33

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/IE 99/00052

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A61B17/12

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 32528 A (O'REGAN) 12 September 1997 (1997-09-12) abstract page 7, line 13 - page 8, line 23 page 10, line 18 - page 11, line 16; claim 1; figures	1-3
X	US 5 320 630 A (AHMED) 14 June 1994 (1994-06-14) the whole document	1,2,4-8
X	GB 1 334 560 A (VAN HOORN) 24 October 1973 (1973-10-24) page 4, line 34-63 page 6, line 56-94; figures	1,2

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents :

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- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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Date of the actual completion of the international search

19 August 1999

Date of mailing of the international search report

26/08/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Giménez Burgos, R

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IE 99/00052

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9732528 A	12-09-1997	US 5741273 A AU 1864997 A	21-04-1998 22-09-1997
US 5320630 A	14-06-1994	US 5423834 A US 5462559 A US 5624453 A	13-06-1995 31-10-1995 29-04-1997
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